Claims

1. Method for the attachment of a functional element (14) having a head end (20) and optionally a shaft part (22), in particular a fastener element, to a sheet metal part (12), optionally in liquid-tight and/or gas-tight form, wherein the functional element is pressed against the sheet metal part (12) supported by a die button having a shaping space (62) and sheet metal material is pressed by means of at least one movably mounted shaped part (50), and preferably by means of at least two such shaped parts (50) of the die button, and by a radially inwardly directed movement of the or each shaped part, into an undercut of the functional element (14), with the or each shaped part forming a respective wall region of the shaping space (62),
characterized in that
the or each shaped part (50) is prevented from a radially inwardly directed movement so long until the sheet metal material is drawn by the head end (20) of the functional element (14) into the shaping space (62) for the formation of a pronounced recess (87) at least largely surrounding the head end and is only then released for the radial movement for the pressing of the sheet metal material into the undercut.

2. Method in accordance with claim 1,
characterized in that
the or each shaped part (50) is rounded at the surfaces (66) facing the sheet metal material at the transition into the wall section (58) forming the shaping space (62) and the said wall section presses the sheet metal material into features of shape (24) at the radially outer side of the head end of the functional element.

3. Method in accordance with claim 1 or claim 2,
characterized in that
the or each shaped part (50) has at its surfaces confronting the sheet metal material, at the transition into the wall section forming the shaping space, a rounded radially inwardly directed projection (64) which presses the sheet metal material into an undercut formed at the head end (20) of the element (14), or at the transition from the head end (20) of the functional element (14) into the shaft part (22).

4. Method in accordance with one of the preceding claims,
characterized in that
the or each shaped part (50) is prevented from the radially inwardly directed movement by an abutment element (68) of the die button (10) which is biased in the direction towards the sheet metal part and against which the or each shaped part is supported and in that the abutment element is urged back by the head end (20) of the functional element (14) through the intermediary of the sheet metal material (12) during the formation of the recess (87) until the support of the or each shaped part at the abutment element is removed.

5. Method in accordance with one of the preceding claims,
characterized in that
the shaped parts (5ß) after the freeing of the radially inwardly directed movement slide under the pressure of the plunger on respective guide tracks (44) inclined to the longitudinal axis (30) of the die button and are thus simultaneously moved axially and radially.

6. Method in accordance with claim 4 and claim 5,
characterized in that

after the attachment of the functional element (14) to the sheet metal part (12), the shaped parts (50) are moved in the axial direction by the biased abutment element (68), with the component assembly formed by the functional element and the sheet metal part, which is also axially moved by the abutment element (68) being released and the axial movement of the component assembly optionally causing a radially outwardly directed movement of the shaped parts permitted by the inclined guide tracks (44).

7. Method in accordance with one of the preceding claims, characterized in that
sheet metal material is brought by means of the shaped parts (50) into engagement with features (24) providing security against rotation, in particular groove-like and/or rib-like features formed on the functional element (14).

8. Method in accordance with one of the preceding claims, characterized in that
the sheet metal part (12) is not perforated and not pierced, at least in the region of the functional element (14) during its attachment to the sheet metal part.

9. Method in accordance with one of the claims 1 to 7, characterized in that
a pre-holed sheet metal part is used and/or in that the sheet metal part is pierced during the attachment of the functional element by means of a self-piercing functional element or a preceding hole punch.

10. Die button (10), in particular for use in the method in accordance with one of the claims 1 to 9 for the attachment of a functional element having a head end (20) and optionally a shaft part (22), in particular a fastener element (14), to a sheet metal part (12), optionally in liquid-tight and/or gas-tight form, wherein the die button (10) has a die button body (40) with at least one shaped part (50) movably mounted therein, preferably at least two such shaped parts and also a biased abutment element (68) for the or each shaped part at the centre of the die button body and wherein the or each shaped part (50) forms a wall region of a shaping space (62) which is provided in the die button in the region of its end face confronting the sheet metal part and is guided by a respective obliquely positioned guide track (44) for a radially inwardly directed movement, which leads to the sheet metal material being pressed into a feature or shape (24), i.e. into an undercut of the functional element,
characterized in that
the abutment element (68) is biased in the direction towards the sheet metal part (12), in that each shaped part (50) is supported on the abutment element (68) during the formation of a recess (62) in the sheet metal part which takes place in the shaping space (62) of the die button by pressure exerted onto the head end (20) of the functional element (14) and is hereby prevented from the radially inwardly directed movement so long until the region of the abutment element (68) against which each shaped part (50) is supported is moved by the said pressure from the head end (20) of the functional element (14) against the bias past the shaped part and has released the radial movement of the shaped part.

11. Die button in accordance with claim 10,
characterized in that,

after the movement of the abutment element (68) past the shaped part (50), the obliquely disposed guide tracks (44) lead, as a result of the pressure on the sheet metal part, to the radially inwardly directed movement of the shaped parts with simultaneous axial movement of the same.

12. Die button in accordance with claim 10 or 11,
characterized in that
the axial length of the region of the abutment element (68) which prevents the shaped parts (50) from the radially inwardly directed movement is so dimensioned that the recess (87) formed by the head end of a functional element in the shaping space (62) of the sheet metal part at least largely surrounds the head end (20) before the support of the shaped parts at this region is removed by sliding this region past the shaped parts and the radial movement of the shaped parts is freed.

13. Die button in accordance with one of the claims 10 to 12,
characterized in that
the shaped parts (50) are rounded at their surfaces (66) confronting the sheet metal material (12) at the transition into the wall sections (58) forming the shaping space (62).

14. Die button in accordance with one of the claims 10 to 13,
characterized in that
the shaped parts (50) have, at their surfaces (66) confronting the sheet metal material (12) at the transition into the wall sections (58) forming the shaping space (62), radially inwardly directed projections (64) which press the sheet metal material into an undercut (24)

formed at the head end (20), or at the transition of the head end (20) of the functional element (14) into the shaft part (22).

15. Die button in accordance with one of the preceding claims 10 to 14, characterized in that
there is provided, for each shaped part (50) there is provided a guide track (44) resembling a T-groove inclined towards the longitudinal axis (30) of the die button in which it slides after freeing of the radially inwardly directed movement under the pressure of a plunger (16) and is thus simultaneously axially and radially moved.

16. Die button in accordance with one of the preceding claims 10 to 15, characterized in that
the shaping space (62) is also formed by fixedly arranged wall regions (60) of the die button body (40) which are each arranged between two movable shaped parts (50) of the die button.

17. Die button in accordance with claim 16,
characterized in that,
in the starting state prior to generation of the recess (87) in the sheet metal part, the fixedly arranged wall regions (60) of the die button body are aligned with or offset fractionally in front of or behind the wall regions (58) of the shaped parts (50) which co-define the shaping space (62), whereas, in the closed state of the die button, after the completion of the connection between the functional element and the sheet metal part, they are significantly set back relative to the radially inwardly advanced wall regions (58) of the shaped parts (50) which co-define the shaping space (62).

18. Die button in accordance with one of the claims 10 to 17,

characterized in that
for the biasing of the abutment element (68) in the axial direction towards the sheet metal part (12) a spring (72) disposed in a hollow cavity of the die button is provided.

19. Die button in accordance with claim 18,
characterized in that
the abutment element (68) has, at its end confronting the spring (72), a radial shoulder (70) which comes into contact with a shoulder (74) of the die button and hereby limits the maximum movement of the abutment element (68) towards the sheet metal part (12).

20. Die button in accordance with claim 19,
characterized in that
the spring (72) is supported at its end remote from the abutment element (68) on an abutment (82) fixed in the die button.

21. Die button in accordance with claim 20,
characterized in that
the spring (72) is pre-stressed between the shoulder (70) of the abutment element (68) and a shoulder of the abutment (82).

22. Die button in accordance with claim 20 or claim 21,
characterized in that
the abutment (82) is held in a longitudinal bore of the die button by means of a spring ring (84).

23. Die button in accordance with one of the claims 10 to 22,
characterized in that

the abutment element (68) has a front pin part (76) the free end face (78) of which can be loaded by the head end (20) of a functional element (14), optionally through the intermediary of the sheet metal part, for the axial movement of the abutment element (68).

24. Die button in accordance with one of the claims 10 to 23, characterized in that
the end faces of the shaped parts (50) confronting the sheet metal part (12) projects, up to the conclusion of the radially inwardly directed movement of the shaped parts (50), beyond the end face (46) of the die button (40).

25. Die button in accordance with claim 24,
characterized in that
at the conclusion of the radial inwardly directed movement of the shaped parts (50) these are flush with the end face (46) of the die button body.